

**WHAT IS CLAIMED**

1. A method of generating a varying frequency waveform comprising the steps of:

(a) generating a first waveform having a time-varying frequency;

(b) generating a second waveform by switching between respective ones of a plurality of waveforms having respectively different frequencies in a manner that maintains phase continuity between said respective ones of said plurality of waveforms contained in said second waveform; and

(c) combining said first waveform with said second waveform to produce said varying frequency waveform.

2. The method according to claim 1, wherein generating said second waveform comprises generating an offset frequency waveform and successively combining said offset frequency waveform with a reference frequency waveform to produce said plurality of waveforms having said respectively different frequencies.

3. The method according to claim 1, wherein generating said first waveform comprises controlling the operation of a first digital synthesizer and translating the output of said first digital synthesizer to generate said first waveform, and wherein generating said second waveform comprises generating said offset frequency waveform by means of a second digital synthesizer,

successively combining said offset frequency waveform with a reference frequency waveform to produce said plurality of waveforms having said respectively different frequencies, and controlling the operation of said second digital synthesizer in a manner that maintains phase continuity between said respective ones of said plurality of waveforms contained in said second waveform.

4. The method according to claim 3, wherein generating said second waveform comprises controlling the operation of said second digital synthesizer so that said offset frequency generated thereby has a prescribed phase that causes said respective ones of said plurality of waveforms, when switched into said second waveform to have phase continuity, at the time of switching.

5. The method according to claim 1, further including the step (d) of translating the frequency range of said second waveform to produce a third waveform and combining said third waveform with said varying frequency waveform to produce a varying frequency output waveform.

6. The method according to claim 1, wherein generating said second waveform comprises the steps of:

(b1) cascading a plurality of frequency converters to the output of a reference frequency waveform generator; and

(b2) coupling an offset frequency waveform to said plurality of frequency converters, so as to cause said plurality of frequency converters to successively combine said offset frequency waveform with said reference frequency waveform to produce said plurality of waveforms having said respectively different frequencies.

7. An apparatus for generating a varying frequency waveform comprising:

a first waveform generator that is operative to generate a first waveform having a time-varying frequency;

a second waveform generator that is operative to generate a second waveform by switching between respective ones of a plurality of waveforms having respectively different frequencies in a manner that maintains phase continuity between said respective ones of said plurality of waveforms contained in said second waveform; and

a mixer that is operative to multiply said first waveform by said second waveform to produce said varying frequency waveform.

8. The apparatus method according to claim 7, wherein said second waveform generator is operative to generate an offset frequency waveform and to successively combine said offset frequency waveform with a reference frequency waveform to produce said plurality

of waveforms having said respectively different frequencies.

9. The apparatus according to claim 7, wherein said first waveform generator comprises a first digital synthesizer and a translator that is operative to translate the output of said first digital synthesizer to generate said first waveform, and wherein said second waveform generator comprises a second digital synthesizer that is operative to generate said offset frequency, and a plurality of cascaded frequency converters that are operative to successively combine said offset frequency waveform with a reference frequency waveform to produce said plurality of waveforms having said respectively different frequencies, and a controller for controlling the operation of said second digital synthesizer in a manner that maintains phase continuity between said respective ones of said plurality of waveforms contained in said second waveform.

10. The apparatus according to claim 9, wherein said controller is operative to control the operation of said second digital synthesizer so that said offset frequency generated thereby has a prescribed phase that causes said respective ones of said plurality of waveforms, when switched into said second waveform, to have phase continuity at the time of switching.

11. The apparatus according to claim 7, further including a multiplier to which said second waveform is coupled to produce a third waveform and an output combiner which is operative to combine said third waveform with said varying frequency waveform to produce a varying frequency output waveform.

12. The apparatus according to claim 7, wherein said second waveform generator comprises at least one frequency converter coupled in cascade with the output of a reference frequency waveform generator and an offset frequency waveform generator which is operative to supply an offset frequency waveform to said at least one frequency converter, so as to cause said at least one frequency converter to combine said offset frequency waveform with said reference frequency waveform to produce said plurality of waveforms having said respectively different frequencies.

13. An apparatus for generating a varying frequency waveform comprising:

- a first direct digital synthesizer that is operative to generate a first phase-coherent waveform having a time-varying frequency;

- a second direct digital synthesizer that is operative to generate an offset frequency waveform;

- a reference frequency waveform generator that is operative to generate a reference frequency waveform;

a plurality of cascaded frequency converters that are operative to successively combine said offset frequency waveform with said reference frequency waveform to produce a plurality of waveforms having respectively different frequencies;

a switch that is operative to switch between said plurality of waveforms produced by said plurality of cascaded frequency converters to realize a second waveform;

a controller for controlling the operation of said second direct digital synthesizer in a manner that maintains phase continuity between said respective ones of said plurality of waveforms contained in said second waveform as realized by said switch; and

a mixer that is operative to multiply said first waveform by said second waveform to produce said varying frequency waveform.

14. The apparatus according to claim 13, wherein said controller is operative to control the operation of said second direct digital synthesizer so that said offset frequency generated thereby has a prescribed phase that causes said respective ones of said plurality of waveforms, when switched into said second waveform by said switch, to have phase continuity at the time of switching.

15. The apparatus according to claim 13, further including delay elements coupled between said plurality

of cascaded frequency converters and said switch, and being operative to delay said respective ones of said plurality of waveforms, so that when switched into said second waveform, new frequencies to which switch transitions will be phase continuous with the frequencies from which said switch has transitioned.

16. The apparatus according to claim 13, further including a frequency for translating the frequency range of said second waveform to produce a third waveform and to combine said third waveform with said varying frequency waveform to produce a varying frequency output waveform.